

520N15N-VB Datasheet

N-Channel 150 V (D-S) MOSFET

PRODUCT SUMMARY	
V _{DS} (V)	150
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.035
Q _g typ. (nC)	8.5
I _D (A)	25.5 ^a
Configuration	Single

FEATURES

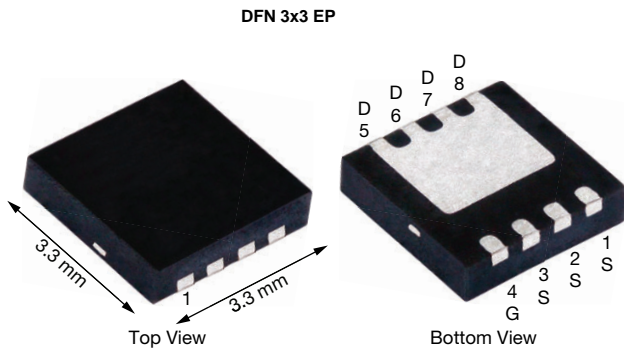
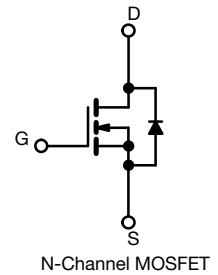
- TrenchFET® with ThunderFET technology optimizes balance of R_{DS(on)}, Q_g, Q_{sw}, and Q_{oss}
- 100 % R_g and UIS tested



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Primary side switching
- Synchronous rectification
- DC/DC converter
- Motor drive control
- Load switch



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V _{DS}	150	V
Gate-source voltage	V _{GS}	± 20	
Continuous drain current (T _J = 150 °C)	I _D	T _C = 25 °C	25.5
		T _C = 70 °C	20.4
		T _A = 25 °C	7 ^{b, c}
		T _A = 70 °C	5.6 ^{b, c}
Pulsed drain current (t = 100 μs)	I _{DM}	50	A
Continuous source-drain diode current	I _S	T _C = 25 °C	54.8
		T _A = 25 °C	4.2 ^{b, c}
Single pulse avalanche current	I _{AS}	20	
Single pulse avalanche energy	E _{AS}	20	mJ
Maximum power dissipation	P _D	T _C = 25 °C	65.8
		T _C = 70 °C	42.1
		T _A = 25 °C	5.1 ^{b, c}
		T _A = 70 °C	3.2 ^{b, c}
Operating junction and storage temperature range	T _J , T _{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^c		260	

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^b	R _{thJA}	20	25	°C/W
Maximum junction-to-case (drain)	R _{thJC}	1.5	1.9	

Notes

- T_C = 25 °C
- Surface mounted on 1" x 1" FR4 board
- t = 10 s
- The DFN3x3 package is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 65 °C/W

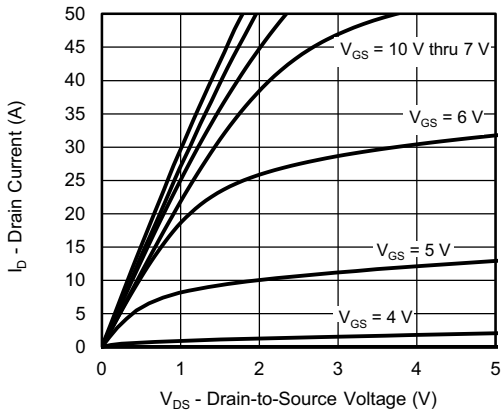
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	150	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ mA}$	-	92	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	-7.1	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2	-	4	V
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 150\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 150\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$	-	-	15	
On-state drain current ^a	$I_{D(on)}$	$V_{DS} \leq 10\text{ V}, V_{GS} = 10\text{ V}$	20	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 7\text{ A}$	-	0.035	-	Ω
Forward transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 7\text{ A}$	-	16	-	S
Dynamic ^b						
Input capacitance	C_{iss}	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	550	-	pF
Output capacitance	C_{oss}		-	120	-	
Reverse transfer capacitance	C_{rss}		-	6	-	
Total gate charge	Q_g	$V_{DS} = 75\text{ V}, V_{GS} = 10\text{ V}, I_D = 7\text{ A}$	-	10.85	22	nC
		$V_{DS} = 75\text{ V}, V_{GS} = 7.5\text{ V}, I_D = 7\text{ A}$	-	8.5	13	
Gate-source charge	Q_{gs}		-	3	-	
Gate-drain charge	Q_{gd}		-	3	-	
Output charge	Q_{oss}	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}$	-	27.7	42	
Gate resistance	R_g	$f = 1\text{ MHz}$	0.24	1.2	2.4	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 75\text{ V}, R_L = 13.4\text{ }\Omega, I_D \cong 5.6\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	18	36	ns
Rise time	t_r		-	6	12	
Turn-off delay time	$t_{d(off)}$		-	30	60	
Fall time	t_f		-	9	18	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 75\text{ V}, R_L = 13.4\text{ }\Omega, I_D \cong 5.6\text{ A}, V_{GEN} = 7.5\text{ V}, R_g = 1\text{ }\Omega$	-	20	40	
Rise time	t_r		-	8	16	
Turn-off delay time	$t_{d(off)}$		-	25	50	
Fall time	t_f		-	11	22	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	54.8	A
Pulse diode forward current	I_{SM}		-	-	50	
Body diode voltage	V_{SD}	$I_S = 5.6\text{ A}, V_{GS} = 0\text{ V}$	-	0.8	1.2	V
Body diode reverse recovery time	t_{rr}	$I_F = 5.6\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	60	120	ns
Body diode reverse recovery charge	Q_{rr}		-	133	266	nC
Reverse recovery fall time	t_a		-	50	-	ns
Reverse recovery rise time	t_b		-	10	-	

Notes

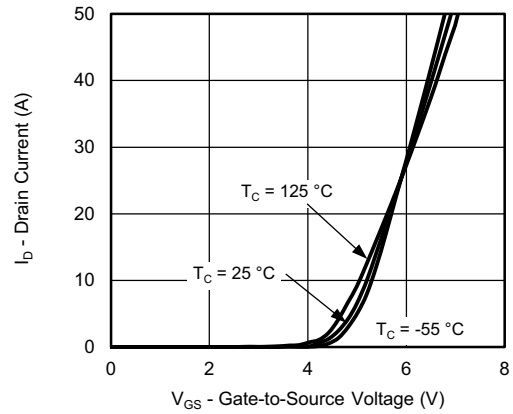
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
 b. Guaranteed by design, not subject to production testing

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

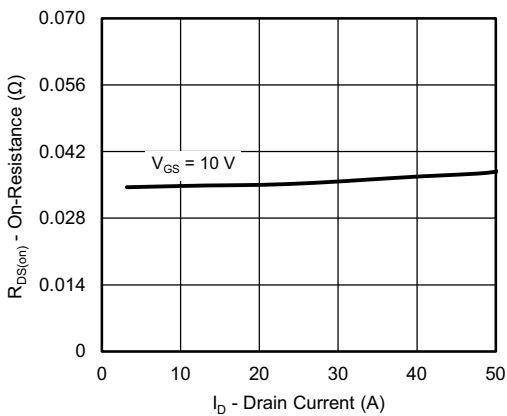
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



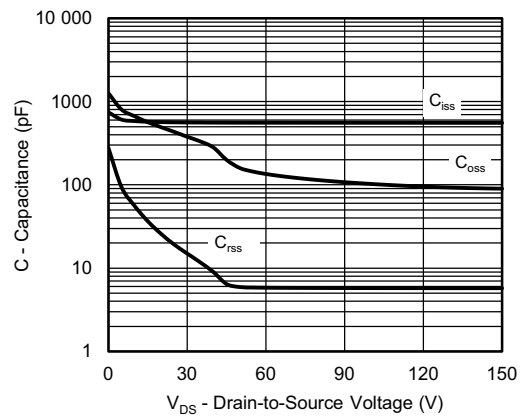
Output Characteristics



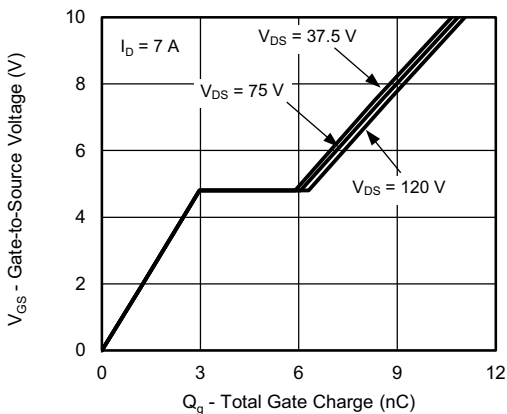
Transfer Characteristics



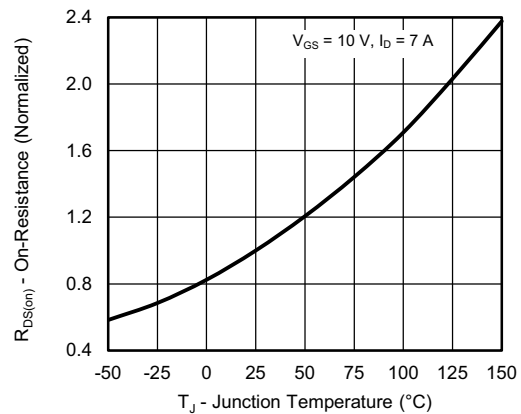
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

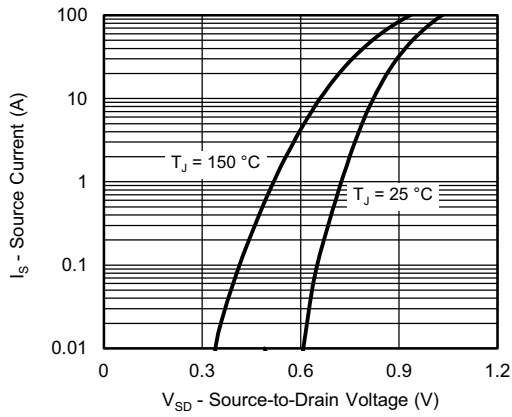


Gate Charge

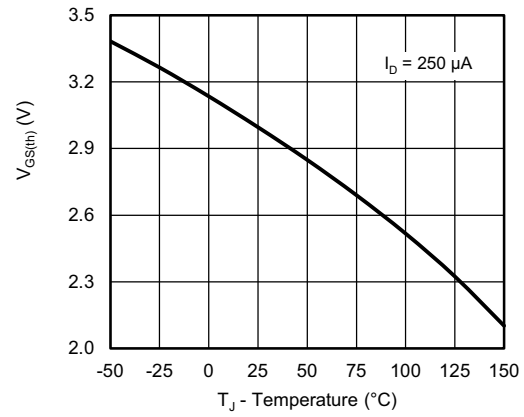


On-Resistance vs. Junction Temperature

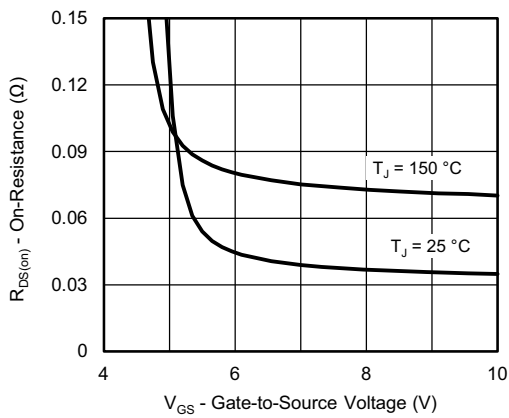
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



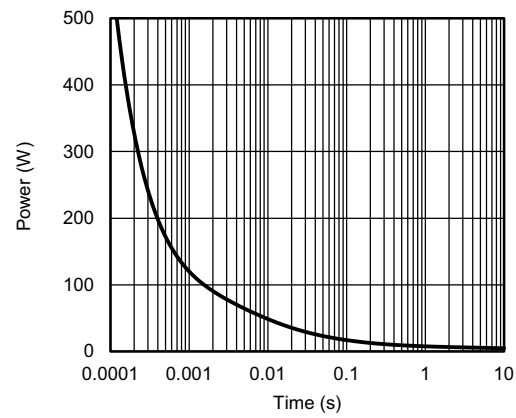
Source-Drain Diode Forward Voltage



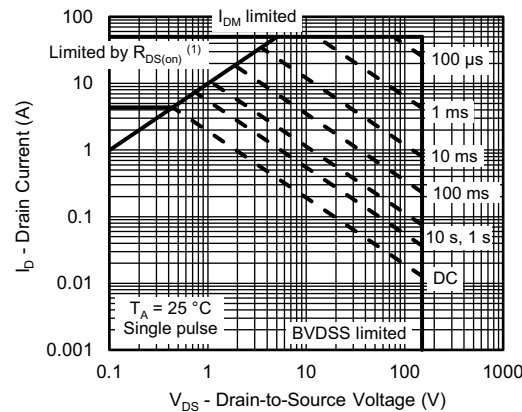
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



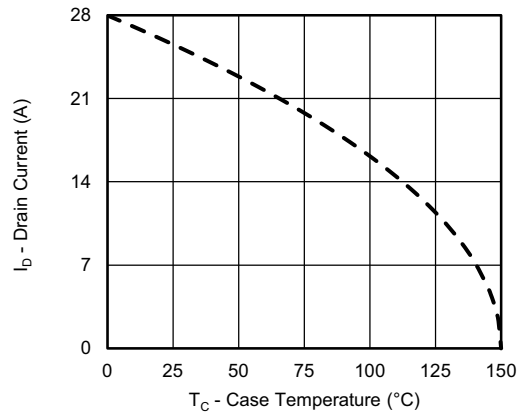
Single Pulse Power, Junction-to-Ambient



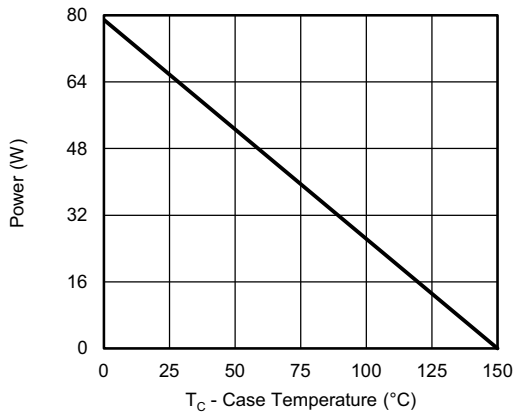
Safe Operating Area, Junction-to-Ambient

(1) $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

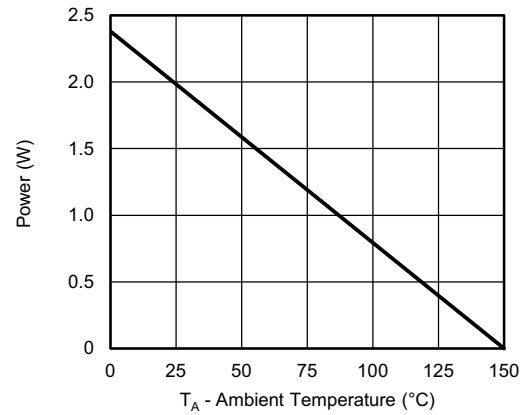
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case

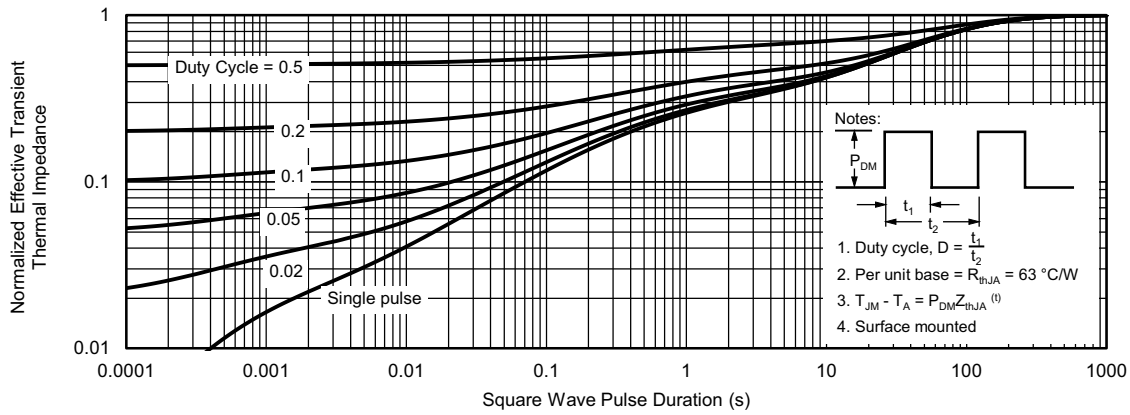


Power, Junction-to-Ambient

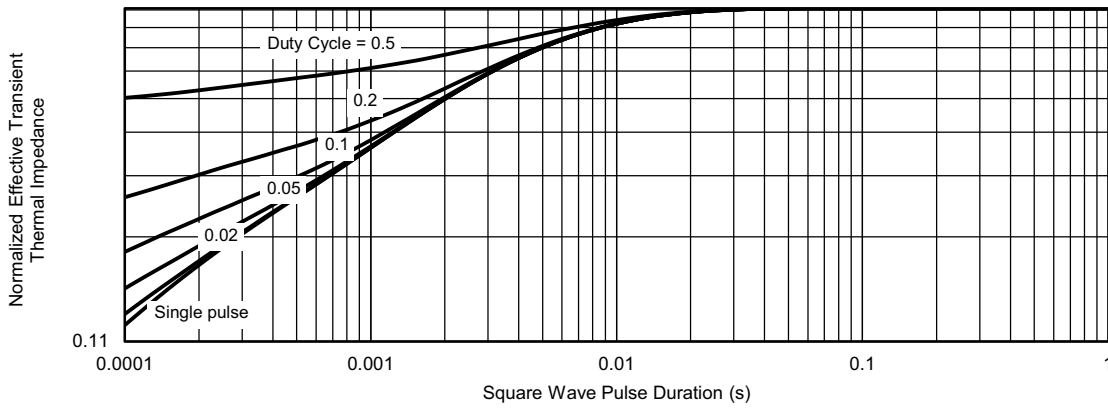
Note

- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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